



BOARD OF PATENT
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PATENT

App 62 ne 26 Docket No. 3495.0059-06

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

HUGHES BLAUDIN DE THE; AGNES
MARCHIO; PIERRE TIOLLAIS; ANNE
DEJEAN; NIGEL BRAND; MARTIN
PETKOVICH; ANDREE KRUST; AND
PIERRE CHAMBON

Serial No.: 07/649,342

Filed: February 1, 1991

For: A NOVEL STEROID/THYROID
HORMONE RECEPTOR-RELATED
GENE INAPPROPRIATELY
EXPRESSED IN HUMAN
HEPATOCELLULAR CARCINOMA

Group Art Unit: 1812

Examiner: J. ULM

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

STATEMENT OF RELEVANT AUTHORITY
PURSUANT TO 37 C.F.R. 1.192(a)

Further to Appellants' Reply Brief of January 24, 1994, Appellants respectfully submit In re Deuel, 51 F.3d 1552 (Fed. Cir. 1995), as relevant authority for consideration of this appeal before the Board of Patent Appeals and Interferences and pursuant to 37 C.F.R. § 1.192(a).

M.P.E.P. 1206 provides that "37 C.F.R. § 1.192 (a) is not intended to preclude the filing of a supplemental paper if a new argument or authority should become available or relevant after the brief was filed." Since Deuel was not published until after the Reply Brief was filed, Appellants request entry and

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consideration of this paper. A copy of the Deuel case is attached for the convenience of the Board.

The Federal Circuit in Deuel held that known techniques for isolating DNA molecules, where an amino acid sequence is partially known and the actual DNA sequence is not known, is essentially irrelevant to claims directed to DNA *per se* in the absence of other prior art suggesting the claimed DNAs. In re Deuel, 51 F.3d 1552, 1559 (Fed. Cir. 1995). The court's rationale provides that a proper rejection of a chemical entity must be based on the structural relationship of a known chemical as compared to the claimed chemical. A structural relationship may provide the requisite motivation or suggestion to modify known compounds. Id. at 1558.

The claims in Deuel were directed to purified and isolated cDNA sequences of human and bovine heparin-binding growth factor (HBGF). The claimed sequences encoded human placental HBGF and bovine uterine HBGF. The Examiner rejected the claims as being obvious over Bohlen, further in view of Maniatis et al. Bohlen did not specifically teach HBGF, but heparin-binding brain mitogens (HBBMs). The Bohlen reference disclosed the first 19 amino acids of HBBMs derived from human and bovine brain tissue. Maniatis et al. taught a general method of isolating DNAs or cDNAs by screening a DNA or cDNA library with a gene probe. The Examiner concluded that it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to clone a gene for HBGF since the artisan could have designed a gene probe based on Bohlen's disclosed N-terminal

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sequence, screened a DNA library according to Maniatis' gene cloning method, and isolated a gene encoding an HBGF.

The court overruled the rejection as failing to provide the requisite structural motivation to render the claimed cDNAs obvious. The court reasoned that the prior art teachings about general concepts, i.e., function and chemical nature, of a protein may be sufficient to render the protein *per se* obvious, but the claims were directed to cDNA molecules. Id. What is required is a teaching of a relevant cDNA molecule or a "specific, structurally-definable compound", which may have suggested making the molecular modifications to arrive at the claimed invention. Id. In the absence of motivation to make the required modifications, the Examiner's rejection was improper as failing to make out a *prima facie* case of obviousness.

The facts of the instant case are analogous to those in Deuel. The instantly claimed invention was rejected by the Examiner as being obvious over Petkovich et al., further taken with Hauptmann et al. and Krust et al.

Similar to Deuel, the instantly claimed DNA sequence of the retinoic acid receptor, RAR- β , was unknown prior to Appellants' discovery. The Examiner cited Petkovich et al. for teaching only RAR- α , and not the claimed DNA encoding RAR- β . This is admitted by the Examiner in the Examiner's Answer at page 5, lines 11-13.

The significant factor in determining obviousness of a new chemical entity is the **structural relationship** of a known

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chemical as compared to the claimed chemical. As set forth in Appellants' Briefs, the DNA of RAR- α and RAR- β are structurally distinct. A **significant** number of structural modifications would be required to arrive at the DNA claimed. For example, Appellants have noted that there exists a homology of as low as 15% and 22% in the end regions of the RAR- α and RAR- β amino acid sequences. (Appeal Brief, page 7, lines 7-11.) These deviations are based upon amino acid sequences. Thus, the structural differences based upon the degeneracy code¹ would be even more significant for the actual DNA encoding RAR- α and RAR- β . Despite Appellants' assertions of material structural distinctions between the claimed DNA and the prior art, the rejection maintains that the claims are obvious without presenting why one having ordinary skill in the art would have been motivated to modify the DNA encoding RAR- α in order to arrive at the claimed invention.

The rejection alleges that the motivation is supplied by the additional references, Hauptmann et al. and Krust et al., to teach the state of the art at the time the claimed invention was made. The Examiner states in the Answer that:

These references show that the isolation of a DNA encoding one protein by screening a suitable DNA library with a DNA encoding a structurally related protein was routine in the art at the time the instant invention was made.

¹ DNAs consist of four different nucleotides. A series of three nucleotides constitute a "codon" and codes for one amino acid. There are 64 possible codons and only 20 natural amino acids. Thus, most amino acids are coded for by more than one codon, which is recognized as the "degeneracy" of the genetic code.

Examiner's Answer, page 5, lines 16-21. Thus, the Examiner asserts that the method of cloning the gene was known in the prior art, as did the Examiner in Deuel.

The instant rejection concludes that one having ordinary skill in the art at the time the claimed invention was made would have isolated a DNA encoding the RAR- β gene product using the DNA encoding the RAR- α taught by Petkovich et al., as a gene probe, screening a liver cDNA library by those methods taught by the Hauptmann et al. and Krust et al. references, and isolating the DNA encoding RAR- β .

These facts are clearly analogous to those in Deuel. Thus, the holding in Deuel should be controlling.

While Appellants acknowledge that the prior art of the instant rejection teaches DNA encoding a related protein, RAR- α , this does not materially distinguish the instant case from the reasoning of Deuel. It is noted that no DNA molecules were taught in Deuel. However, Appellants submit that the DNA molecule encoding RAR- α still does not provide the requisite structural basis for obviousness. Whether or not two proteins fall within the same class of proteins does not constitute structural obviousness of claimed DNA, where the Examiner fails to establish that the DNA molecules encoding these two related, but different, proteins are structurally similar. General teachings as to the functional relationships between two proteins as a basis for obviousness was rejected in Deuel, especially where the claims are not directed to the protein *per se*, but the DNA molecule.

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The rejection further relies upon the general methods of gene cloning taught by the secondary references. However, these references fail to provide the motivation to modify. Deuel provides that whether or not the process of producing, i.e., the mere identification of the RAR- β gene, is obvious is irrelevant to the structural obviousness of the claimed DNA. Thus, the known methods of gene cloning taught by Hauptmann et al. and Krust et al. cannot create *prima facie* obviousness.

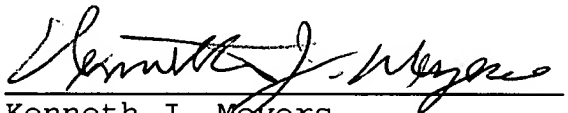
In the absence of a suggestion by the prior art to make the modifications of the DNA encoding RAR- α to arrive at the claimed invention, the DNA encoding RAR- β , Deuel compels reversal of the rejection under 35 U.S.C. § 103.

If there are any other fees due in connection with the filing of this response, including any fees required for an extension of time under 37 C.F.R. § 1.136, such an extension is requested, and the Commissioner is authorized to charge any related fees to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
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By:


Kenneth J. Meyers
Reg. No. 25,146

Dated: March 13, 1996

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ty from the claim based on her entry into the Lenzes' house.

[19] The Lenzes have also failed to carry their burden as to the seizure of Desirae's belongings. In particular, they have failed to cite any law or facts available to Winburn that would have led a reasonable official in her shoes to conclude that seizing Desirae's belongings would infringe upon a possessory interest of the Lenzes. Qualified immunity analysis asks the objective question whether a reasonable officer could have believed his conduct lawful under clearly established law in light of the information the officer possessed. *See Anderson*, 483 U.S. at 641, 107 S.Ct. at 3040. By all the outward circumstances apparent in the summary judgment record, an official in Winburn's shoes would in fact have concluded that Desirae's clothes, stuffed animals, toys, and books belonged to Desirae. The items were in Desirae's room and would appear suitable only to a child's use. The Lenzes asserted no property interest at the time to inform Winburn that the objects were in fact only lent to Desirae for her use while she was in the Lenzes' house. Based on these facts, the only ones available to Winburn at the time, a reasonable official could not have known that taking the items was a seizure in violation of the Lenzes' Fourth Amendment rights.

V. Conclusion

For the foregoing reasons, we AFFIRM summary judgment as to all defendants.

AFFIRMED.



In re Thomas F. DEUEL, Yue-Sheng Li,
Ned R. Siegel and Peter G. Milner.

No. 94-1202.

United States Court of Appeals,
Federal Circuit.

March 28, 1995.

Inventors applied for patent for deoxyribonucleic acid (DNA) and complementary DNA (cDNA) molecules encoding proteins that stimulated cell division. After patent examiner rejected claims as unpatentable on grounds of obviousness and the Patent and Trademark Office Board of Patent Appeals and Interferences affirmed, inventors appealed. The Court of Appeals, Lourie, Circuit Judge, held that: (1) combination of prior art reference teaching method of gene cloning, together with reference disclosing partial amino acid sequence for a protein that stimulated cell division, did not render claims *prima facie* obvious; (2) conceived method of preparing some unidentified DNA does not define it with precision necessary to render it obvious over protein it encodes; and (3) patent claims generically encompassing all DNA sequences encoding human and bovine proteins to stimulate cell division were not invalid as obvious.

Reversed.

1. Patents \S 314(5), 324.55(1)

Obviousness is question of law, which Court of Appeals reviews *de novo*, though factual findings underlying obviousness determination are reviewed for clear error. 35 U.S.C.A. \S 103.

2. Patents \S 32

Patent examiner bears burden of establishing *prima facie* case of obviousness; only if this burden is met does burden of coming forward with rebuttal argument or evidence shift to applicant. 35 U.S.C.A. \S 103.

3. Patents \S 36(1), 324.55(4)

When references cited by patent examiner fail to establish *prima facie* case of obviousness, rejection on ground of obviousness

is improper and will be overturned. 35 U.S.C.A. § 103. 9. Patents ⇨26(1)

4. Patents ⇨16.3, 16.25

Combination of prior art reference teaching method of gene cloning, together with reference disclosing partial amino acid sequence for a protein that stimulated cell division, did not render deoxyribonucleic acid (DNA) and complementary DNA (cDNA) molecules encoding protein *prima facie* obvious; prior art did not disclose any relevant cDNA molecules, let alone close relatives of specific, structurally defined cDNA molecules of patent claims. 35 U.S.C.A. § 103.

5. Patents ⇨16.3, 16.25

Prior art disclosure of amino acid sequence of protein does not necessarily render particular deoxyribonucleic acid (DNA) molecules encoding protein obvious because redundancy of genetic code permits one to hypothesizing enormous number of DNA sequences coding for the protein; no particular one of these DNAs can be obvious unless there is something in prior art to lead to particular DNA and indicate that it should be prepared. 35 U.S.C.A. § 103.

6. Patents ⇨16.25

Existence of general method of isolating complementary deoxyribonucleic acid (cDNA) or DNA molecules is essentially irrelevant to question of whether specific molecules themselves would have been obvious, in absence of other prior art that suggests claimed DNAs. 35 U.S.C.A. § 103.

7. Patents ⇨26(1)

Where there is prior art that suggests claimed compound, existence, or lack thereof, of enabling process for making that compound is factor in any patentability determination; there must, however, still be prior art that suggests claimed compound in order for *prima facie* case of obviousness to be made out. 35 U.S.C.A. § 103.

8. Patents ⇨16(1)

General incentive does not make obvious particular result, nor does existence of techniques by which to make those efforts to be carried out. 35 U.S.C.A. § 103.

Fact that one can conceive general process in advance for preparing undefined compound does not mean that claimed specific compound was precisely envisioned and therefore obvious. 35 U.S.C.A. § 103.

10. Patents ⇨26(1)

Conceived method of preparing some unidentified deoxyribonucleic acid (DNA) does not define it with precision necessary to render it obvious over protein it encodes. 35 U.S.C.A. § 103.

11. Patents ⇨26(1)

Patent claims generically encompassing all deoxyribonucleic acid (DNA) sequences encoding human and bovine protein to stimulate cell division were not invalid as obvious, where prior art disclosed only partial amino acid sequence for the protein. 35 U.S.C.A. § 103.

G. Harley Blosser, Senniger, Powers, Leavitt & Roedel, of St. Louis, MO, argued for appellants. With him on the brief was Donald G. Leavitt.

Donald S. Chisum, Morrison & Foerster, Seattle, WA, argued for amicus curiae, The Biotechnology Industry Ass'n and The Bay Area Bioscience Center. With him on the brief were Debra A. Shetka, Morrison & Forester, Palo Alto, CA and Robert P. Blackburn, Emeryville, CA.

Teddy S. Gron, Acting Associate Sol., Arlington, VA, argued for appellee. With him on the brief was Albin F. Drost, Acting Sol. Nancy J. Linck, Office of the Sol., Arlington, VA, represented appellee.

Before ARCHER, Chief Judge, NIES and LOURIE, Circuit Judges.

LOURIE, Circuit Judge.

Thomas F. Deuel, Yue-Sheng Li, Ned R. Siegel, and Peter G. Milner (collectively "Deuel") appeal from the November 30, 1993 decision of the U.S. Patent and Trademark Office Board of Patent Appeals and Interferences affirming the examiner's final rejection of claims 4-7 of application Serial No. 07/542,232, entitled "Heparin-Binding

Growth Factor," as unpatentable on the ground of obviousness under 35 U.S.C. § 103 (1988). *Ex parte Deuel*, 33 USPQ2d 1445 (Bd.Pat.App.Int.1993). Because the Board erred in concluding that Deuel's claims 5 and 7 directed to specific cDNA molecules would have been obvious in light of the applied references, and no other basis exists in the record to support the rejection with respect to claims 4 and 6 generically covering all possible DNA molecules coding for the disclosed proteins, we reverse.

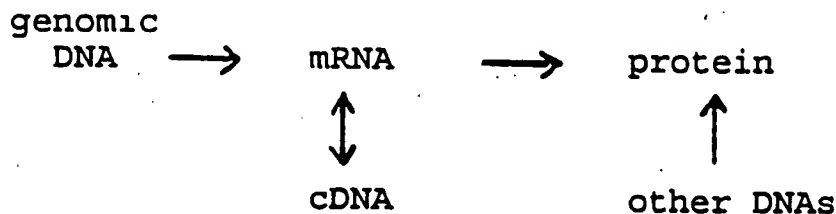
BACKGROUND

The claimed invention relates to isolated and purified DNA and cDNA molecules encoding heparin-binding growth factors ("HBGFs").¹ HBGFs are proteins that stimulate mitogenic activity (cell division) and thus facilitate the repair or replacement of damaged or diseased tissue. DNA (deoxyribonucleic acid) is a generic term which encompasses an enormous number of complex macromolecules made up of nucleotide units. DNAs consist of four different nucleotides containing the nitrogenous bases adenine, guanine, cytosine, and thymine. A sequential grouping of three such nucleotides (a "codon") codes for one amino acid. A DNA's sequence of codons thus determines the sequence of amino acids assembled during pro-

tein synthesis. Since there are 64 possible codons, but only 20 natural amino acids, most amino acids are coded for by more than one codon. This is referred to as the "redundancy" or "degeneracy" of the genetic code.

DNA functions as a blueprint of an organism's genetic information. It is the major component of genes, which are located on chromosomes in the cell nucleus. Only a small part of chromosomal DNA encodes functional proteins.

Messenger ribonucleic acid ("mRNA") is a similar molecule that is made or transcribed from DNA as part of the process of protein synthesis. Complementary DNA ("cDNA") is a complementary copy ("clone") of mRNA, made in the laboratory by reverse transcription of mRNA. Like mRNA, cDNA contains only the protein-encoding regions of DNA. Thus, once a cDNA's nucleotide sequence is known, the amino acid sequence of the protein for which it codes may be predicted using the genetic code relationship between codons and amino acids. The reverse is not true, however, due to the degeneracy of the code. Many other DNAs may code for a particular protein. The functional relationships between DNA, mRNA, cDNA, and a protein may conveniently be expressed as follows:



Collections ("libraries") of DNA and cDNA molecules derived from various species may be constructed in the laboratory or obtained from commercial sources. Complementary DNA libraries contain a mixture of cDNA clones reverse-transcribed from the mRNAs found in a specific tissue source. Complementary DNA libraries are tissue-specific be-

cause proteins and their corresponding mRNAs are only made ("expressed") in specific tissues, depending upon the protein. Genomic DNA ("gDNA") libraries, by contrast, theoretically contain all of a species' chromosomal DNA. The molecules present in cDNA and DNA libraries may be of unknown-function and chemical structure, and

1. For a more extensive discussion of recombinant DNA technology, see *In re O'Farrell*, 853 F.2d 894, 895-99, 7 USPQ2d 1673, 1674-77 (Fed.Cir.1988); *Amgen Inc. v. Chugai Pharma-*

ceutical Co., 927 F.2d 1200, 18 USPQ2d 1016 (Fed.Cir.), cert. denied, 502 U.S. 856, 112 S.Ct. 169, 116 L.Ed.2d 132 (1991).

the proteins which they encode may be unknown. However, one may attempt to retrieve molecules of interest from cDNA or gDNA libraries by screening such libraries with a gene probe, which is a synthetic radio-labelled nucleic acid sequence designed to bond ("hybridize") with a target complementary base sequence. Such "gene cloning" techniques thus exploit the fact that the bases in DNA always hybridize in complementary pairs: adenine bonds with thymine and guanine bonds with cytosine. A gene probe for potentially isolating DNA or cDNA encoding a protein may be designed once the protein's amino acid sequence, or a portion thereof, is known.

As disclosed in Deuel's patent application, Deuel isolated and purified HBGF from bovine uterine tissue, found that it exhibited mitogenic activity, and determined the first 25 amino acids of the protein's N-terminal sequence.² Deuel then isolated a cDNA molecule encoding bovine uterine HBGF by screening a bovine uterine cDNA library with an oligonucleotide probe designed using the experimentally determined N-terminal sequence of the HBGF. Deuel purified and sequenced the cDNA molecule, which was found to consist of a sequence of 1196 nucleotide base pairs. From the cDNA's nucleotide sequence, Deuel then predicted the complete amino acid sequence of bovine uterine HBGF disclosed in Deuel's application.

Deuel also isolated a cDNA molecule encoding human placental HBGF by screening a human placental cDNA library using the isolated bovine uterine cDNA clone as a probe. Deuel purified and sequenced the human placental cDNA clone, which was found to consist of a sequence of 961 nucleotide base pairs. From the nucleotide sequence of the cDNA molecule encoding human placental HBGF, Deuel predicted the complete amino acid sequence of human placental HBGF disclosed in Deuel's application. The predicted human placental and bovine uterine HBGFs each have 168 amino acids and calculated molecular weights of 18.9 kD. Of the 168 amino acids present in the two HBGFs discovered by Deuel, 163 are identi-

cal. Deuel's application does not describe the chemical structure of, or state how to isolate and purify, any DNA or cDNA molecule except the disclosed human placental and bovine uterine cDNAs, which are the subject of claims 5 and 7.

Claims 4-7 on appeal are all independent claims and read, in relevant part, as follows:

4. A purified and isolated DNA sequence consisting of a sequence encoding human heparin binding growth factor of 168 amino acids having the following amino acid sequence: Met Gln Ala ... [remainder of 168 amino acid sequence].

5. The purified and isolated cDNA of human heparin-binding growth factor having the following nucleotide sequence: GTCAAAGGCA ... [remainder of 961 nucleotide sequence].

6. A purified and isolated DNA sequence consisting of a sequence encoding bovine heparin binding growth factor of 168 amino acids having the following amino acid sequence: Met Gln Thr ... [remainder of 168 amino acid sequence].

7. The purified and isolated cDNA of bovine heparin-binding growth factor having the following nucleotide sequence: GAGTGGAGAG ... [remainder of 1196 nucleotide sequence].

Claims 4 and 6 generically encompass *all* isolated/purified DNA sequences (natural and synthetic) encoding human and bovine HBGFs, despite the fact that Deuel's application does not describe the chemical structure of, or tell how to obtain, any DNA or cDNA except the two disclosed cDNA molecules. Because of the redundancy of the genetic code, claims 4 and 6 each encompass an enormous number of DNA molecules, including the isolated/purified chromosomal DNAs encoding the human and bovine proteins. Claims 5 and 7, on the other hand, are directed to the specifically disclosed cDNA molecules encoding human and bovine HBGFs, respectively.

During prosecution, the examiner rejected claims 4-7 under 35 U.S.C. § 103 as unpatentable over the combined teachings of Boh-

2. Deuel determined that the N-terminal sequence of bovine uterus HBGF is Gly-Lys-Lys-Glu-Lys-

Pro-Glu-Lys-Lys-Val-Lys-Lys-Ser-Asp-Cys-Gly-Glu-Trp-Gln-Trp-Ser-Val-Cys-Val-Pro.

len³ and Maniatis.⁴ The Bohlen reference discloses a group of protein growth factors designated as heparin-binding brain mitogens ("HBBMs") useful in treating burns and promoting the formation, maintenance, and repair of tissue, particularly neural tissue. Bohlen isolated three such HBBMs from human and bovine brain tissue. These proteins have respective molecular weights of 15 kD, 16 kD, and 18 kD. Bohlen determined the first 19 amino acids of the proteins' N-terminal sequences, which were found to be identical for human and bovine HBBMs.⁵ Bohlen teaches that HBBMs are brain-specific, and suggests that the proteins may be homologous between species. The reference provides no teachings concerning DNA or cDNA coding for HBBMs.

Maniatis describes a method of isolating DNAs or cDNAs by screening a DNA or cDNA library with a gene probe. The reference outlines a general technique for cloning a gene; it does not describe how to isolate a particular DNA or cDNA molecule. Maniatis does not discuss certain steps necessary to isolate a target cDNA, *e.g.*, selecting a tissue-specific cDNA library containing a target cDNA and designing an oligonucleotide probe that will hybridize with the target cDNA.

The examiner asserted that, given Bohlen's disclosure of a heparin-binding protein and its N-terminal sequence and Maniatis's gene cloning method, it would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to clone a gene for HBGF.⁶ According to the examiner, Bohlen's published N-terminal sequence would have motivated a person of ordinary skill in the art to clone such a gene because cloning the gene would allow recombinant production of HBGF, a useful protein. The examiner reasoned that a person of ordinary

skill in the art could have designed a gene probe based on Bohlen's disclosed N-terminal sequence, then screened a DNA library in accordance with Maniatis's gene cloning method to isolate a gene encoding an HBGF. The examiner did not distinguish between claims 4 and 6 generically directed to all DNA sequences encoding human and bovine HBGFs and claims 5 and 7 reciting particular cDNAs.

In reply, Deuel argued, *inter alia*, that Bohlen teaches away from the claimed cDNA molecules because Bohlen suggests that HBBMs are brain-specific and, thus, a person of ordinary skill in the art would not have tried to isolate corresponding cDNA clones from human placental and bovine uterine cDNA libraries. The examiner made the rejection final, however, asserting that

[t]he starting materials are not relevant in this case, because it was well known in the art at the time the invention was made that proteins, especially the general class of heparin binding proteins, are highly homologous between species and tissue type. It would have been entirely obvious to attempt to isolate a known protein from different tissue types and even different species.

No prior art was cited to support the proposition that it would have been obvious to screen human placental and bovine uterine cDNA libraries for the claimed cDNA clones. Presumably, the examiner was relying on Bohlen's suggestion that HBBMs may be homologous between species, although the examiner did not explain how homology between species suggests homology between tissue types.

The Board affirmed the examiner's final rejection. In its opening remarks, the Board noted that it is "constantly advised by the

Lys-Pro-Glu-Lys-Lys-Val-Lys-Lys-Ser-Asp-Cys-Gly-Glu-Trp-Gln. This sequence matches the first 19 amino acids of Deuel's disclosed N-terminal sequence.

3. European Patent Application No. 0326075, naming Peter Bohlen as inventor, published August 2, 1989.

4. Maniatis et al., *Molecular Cloning: A Laboratory Manual*, "Screening Bacteriophage [λ] Libraries for Specific DNA Sequences by Recombination in *Escherichia coli*," Cold Spring Harbor Laboratory, New York, 1982, pp. 353-361.

5. Bohlen's disclosed N-terminal sequence for human and bovine HBBMs is Gly-Lys-Lys-Glu-

6. The examiner and the Board apparently used the term "gene" to refer both to natural (chromosomal) DNA and synthetic cDNA. We will use the several terms as appropriate.

patent examiners, who are highly skilled in this art, that cloning procedures are routine in the art." According to the Board, "the examiners urge that when the sequence of a protein is placed into the public domain, the gene is also placed into the public domain because of the routine nature of cloning techniques." Addressing the rejection at issue, the Board determined that Bohlen's disclosure of the existence and isolation of HBBM, a functional protein, would also advise a person of ordinary skill in the art that a gene exists encoding HBBM. The Board found that a person of ordinary skill in the art would have been motivated to isolate such a gene because the protein has useful mitogenic properties, and isolating the gene for HBBM would permit large quantities of the protein to be produced for study and possible commercial use. Like the examiner, the Board asserted, without explanation, that HBBMs are the same as HBGFs and that the genes encoding these proteins are identical. The Board concluded that "the Bohlen reference would have suggested to those of ordinary skill in this art that they should make the gene, and the Maniatis reference would have taught a technique for 'making' the gene with a reasonable expectation of success." Responding to Deuel's argument that the claimed cDNA clones were isolated from human placental and bovine uterine cDNA libraries, whereas the combined teachings of Bohlen and Maniatis would only have suggested screening a brain tissue cDNA library, the Board stated that "the claims before us are directed to the product and not the method of isolation. Appellants have not shown that the claimed DNA was not present in and could not have been readily isolated from the brain tissue utilized by Bohlen." Deuel now appeals.⁷

DISCUSSION

[1-3] Obviousness is a question of law, which we review *de novo*, though factual findings underlying the Board's obviousness determination are reviewed for clear error.

7. Deuel is supported in its appeal by an *amicus curiae* brief submitted by the Biotechnology Industry Organization and the Bay Area Science Center. Amici urge that, contrary to controlling precedent, the PTO has unlawfully adopted a *per*

In re Vaeck, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed.Cir.1991); *In re Woodruff*, 919 F.2d 1575, 1577, 16 USPQ2d 1934, 1935 (Fed.Cir.1990). The examiner bears the burden of establishing a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed.Cir.1993); *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed.Cir.1992). Only if this burden is met does the burden of coming forward with rebuttal argument or evidence shift to the applicant. *Rijckaert*, 9 F.3d at 1532, 28 USPQ2d at 1956. When the references cited by the examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed.Cir.1988).

[4] On appeal, Deuel challenges the Board's determination that the applied references establish a *prima facie* case of obviousness. In response, the PTO maintains that the claimed invention would have been *prima facie* obvious over the combined teachings of Bohlen and Maniatis. Thus, the appeal raises the important question whether the combination of a prior art reference teaching a method of gene cloning, together with a reference disclosing a partial amino acid sequence of a protein, may render DNA and cDNA molecules encoding the protein *prima facie* obvious under § 103.

Deuel argues that the PTO failed to follow the proper legal standard in determining that the claimed cDNA molecules would have been *prima facie* obvious despite the lack of structurally similar compounds in the prior art. Deuel argues that the PTO has not cited a reference teaching cDNA molecules, but instead has improperly rejected the claims based on the alleged obviousness of a method of making the molecules. We agree.

Because Deuel claims new chemical entities in structural terms, a *prima facie* case of unpatentability requires that the teachings of the prior art suggest *the claimed compounds* to a person of ordinary skill in the art.

se rule that a gene is *prima facie* obvious when at least part of the amino acid sequence of the protein encoded by the gene is known in the prior art.

Normally a *prima facie* case of obviousness is based upon structural similarity, i.e., an established structural relationship between a prior art compound and the claimed compound. Structural relationships may provide the requisite motivation or suggestion to modify known compounds to obtain new compounds. For example, a prior art compound may suggest its homologs because homologs often have similar properties and therefore chemists of ordinary skill would ordinarily contemplate making them to try to obtain compounds with improved properties. Similarly, a known compound may suggest its analogs or isomers, either geometric isomers (cis v. trans) or position isomers (e.g., ortho v. para).

In all of these cases, however, the prior art teaches a specific, structurally-definable compound and the question becomes whether the prior art would have suggested making the specific molecular modifications necessary to achieve the claimed invention. See *In re Jones*, 958 F.2d 347, 351, 21 USPQ2d 1941, 1944 (Fed.Cir.1992); *In re Dillon*, 919 F.2d 688, 692, 16 USPQ2d 1897, 1901 (Fed.Cir. 1990) (en banc) ("structural similarity between claimed and prior art subject matter, ... where the prior art gives reason or motivation to make the claimed compositions, creates a *prima facie* case of obviousness"), *cert. denied*, 500 U.S. 904, 111 S.Ct. 1682, 114 L.Ed.2d 77 (1991); *In re Grabiak*, 769 F.2d 729, 731-32, 226 USPQ 870, 872 (Fed.Cir. 1985) ("[I]n the case before us there must be adequate support in the prior art for the [prior art] ester/[claimed] thioester change in structure, in order to complete the PTO's *prima facie* case and shift the burden of going forward to the applicant."); *In re Lahu*, 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed.Cir.1984) ("The prior art must provide one of ordinary skill in the art the motivation to make the proposed molecular modifications needed to arrive at the claimed compound.").

Here, the prior art does not disclose any relevant cDNA molecules, let alone close relatives of the specific, structurally-defined cDNA molecules of claims 5 and 7 that might render them obvious. Maniatis suggests an allegedly obvious process for trying to isolate

cDNA molecules, but that, as we will indicate below, does not fill the gap regarding the subject matter of claims 5 and 7. Further, while the general idea of the claimed molecules, their function, and their general chemical nature may have been obvious from Bohlen's teachings, and the knowledge that some gene existed may have been clear, the precise cDNA molecules of claims 5 and 7 would not have been obvious over the Bohlen reference because Bohlen teaches proteins, not the claimed or closely related cDNA molecules. The redundancy of the genetic code precluded contemplation of or focus on the specific cDNA molecules of claims 5 and 7. Thus, one could not have conceived the subject matter of claims 5 and 7 based on the teachings in the cited prior art because, until the claimed molecules were actually isolated and purified, it would have been highly unlikely for one of ordinary skill in the art to contemplate what was ultimately obtained. What cannot be contemplated or conceived cannot be obvious.

The PTO's theory that one might have been motivated to try to do what Deuel in fact accomplished amounts to speculation and an impermissible hindsight reconstruction of the claimed invention. It also ignores the fact that claims 5 and 7 are limited to specific compounds, and any motivation that existed was a general one, to try to obtain a gene that was yet undefined and may have constituted many forms. A general motivation to search for some gene that exists does not necessarily make obvious a specifically-defined gene that is subsequently obtained as a result of that search. More is needed and it is not found here.

[5] The genetic code relationship between proteins and nucleic acids does not overcome the deficiencies of the cited references. A prior art disclosure of the amino acid sequence of a protein does not necessarily render particular DNA molecules encoding the protein obvious because the redundancy of the genetic code permits one to hypothesize an enormous number of DNA sequences coding for the protein. No particular one of these DNAs can be obvious unless there is something in the prior art to lead to the particular DNA and indicate that it should be

prepared. We recently held in *In re Baird*, 16 F.3d 380, 29 USPQ2d 1550 (Fed.Cir.1994), that a broad genus does not necessarily render obvious each compound within its scope. Similarly, knowledge of a protein does not give one a conception of a particular DNA encoding it. Thus, *a fortiori*, Bohlen's disclosure of the N-terminal portion of a protein, which the PTO urges is the same as HBGF, would not have suggested the particular cDNA molecules defined by claims 5 and 7. This is so even though one skilled in the art knew that some DNA, albeit not in purified and isolated form, did exist. The compounds of claims 5 and 7 are specific compounds not suggested by the prior art. A different result might pertain, however, if there were prior art, *e.g.*, a protein of sufficiently small size and simplicity, so that lacking redundancy, each possible DNA would be obvious over the protein. See *In re Petering*, 301 F.2d 676 (CCPA 1962) (prior art reference disclosing limited genus of 20 compounds rendered every species within the genus unpatentable). That is not the case here.

The PTO's focus on known methods for potentially isolating the claimed DNA molecules is also misplaced because the claims at issue define compounds, not methods. See *In re Bell*, 991 F.2d 781, 785, 26 USPQ2d 1529, 1532 (Fed.Cir.1993). In *Bell*, the PTO asserted a rejection based upon the combination of a primary reference disclosing a protein (*and its complete amino acid sequence*) with a secondary reference describing a general method of gene cloning. We reversed the rejection, holding in part that "[t]he PTO's focus on Bell's method is misplaced. Bell does not claim a method. Bell claims compositions, and the issue is the obviousness of the claimed compositions, not of the method by which they are made." *Id.*

[6-8] We today reaffirm the principle, stated in *Bell*, that the existence of a general method of isolating cDNA or DNA molecules is essentially irrelevant to the question whether the specific molecules themselves would have been obvious, in the absence of other prior art that suggests the claimed DNAs. A prior art disclosure of a process *reciting a particular compound* or obvious variant thereof as a product of the process is,

of course, another matter, raising issues of anticipation under 35 U.S.C. § 102 as well as obviousness under § 103. Moreover, where there is prior art that suggests a claimed compound, the existence, or lack thereof, of an enabling process for making that compound is surely a factor in any patentability determination. See *In re Brown*, 329 F.2d 1006, 141 USPQ 245 (CCPA 1964) (reversing rejection for lack of an enabling method of making the claimed compound). There must, however, still be prior art that suggests the claimed compound in order for a *prima facie* case of obviousness to be made out; as we have already indicated, that prior art was lacking here with respect to claims 5 and 7. Thus, even if, as the examiner stated, the existence of general cloning techniques, coupled with knowledge of a protein's structure, might have provided motivation to prepare a cDNA or made it obvious to prepare a cDNA, that does not necessarily make obvious a particular claimed cDNA. "Obvious to try" has long been held not to constitute obviousness. *In re O'Farrell*, 853 F.2d 894, 903, 7 USPQ2d 1673, 1680-81 (Fed.Cir.1988). A general incentive does not make obvious a particular result, nor does the existence of techniques by which those efforts can be carried out. Thus, Maniatis's teachings, even in combination with Bohlen, fail to suggest the claimed invention.

[9, 10] The PTO argues that a compound may be defined by its process of preparation and therefore that a conceived process for making or isolating it provides a definition for it and can render it obvious. It cites *Amgen Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200, 18 USPQ2d 1016 (Fed.Cir.), *cert. denied*, 502 U.S. 856, 112 S.Ct. 169, 116 L.Ed.2d 132 (1991), for that proposition. We disagree. The fact that one can conceive a general process in advance for preparing an *undefined* compound does not mean that a claimed *specific* compound was precisely envisioned and therefore obvious. A substance may indeed be defined by its process of preparation. That occurs, however, when it has already been prepared by that process and one therefore knows that the result of that process is the stated compound. The process is part of the definition of the com-

pound. But that is not possible in advance, especially when the hypothetical process is only a general one. Thus, a conceived method of preparing some undefined DNA does not define it with the precision necessary to render it obvious over the protein it encodes. We did not state otherwise in *Amgen*. See *Amgen*, 927 F.2d at 1206-09, 18 USPQ2d at 1021-23 (isolated/purified human gene held nonobvious; no conception of gene without envisioning its precise identity despite conception of general process of preparation).

We conclude that, because the applied references do not teach or suggest the claimed cDNA molecules, the final rejection of claims 5 and 7 must be reversed. See also *Bell*, 991 F.2d at 784-85, 26 USPQ2d at 1531-32 (human DNA sequences encoding IGF proteins nonobvious over asserted combination of references showing gene cloning method and complete amino acid sequences of IGFs).

[11] Claims 4 and 6 are of a different scope than claims 5 and 7. As is conceded by Deuel, they generically encompass all DNA sequences encoding human and bovine HBGFs. Written in such a result-oriented form, claims 4 and 6 are thus tantamount to the general idea of all genes encoding the protein, all solutions to the problem. Such an idea might have been obvious from the *complete* amino acid sequence of the protein, coupled with knowledge of the genetic code, because this information may have enabled a person of ordinary skill in the art to envision the idea of, and, perhaps with the aid of a computer, even identify all members of the claimed genus. The Bohlen reference, however, only discloses a partial amino acid sequence, and thus it appears that, based on the above analysis, the claimed genus would not have been obvious over this prior art disclosure. We will therefore also reverse the final rejection of claims 4 and 6 because neither the Board nor the patent examiner articulated any separate reasons for holding these claims unpatentable apart from the grounds discussed above.

One further matter requires comment. Because Deuel's patent application does not describe how to obtain any DNA except the disclosed cDNA molecules, claims 4 and 6 may be considered to be inadequately sup-

ported by the disclosure of the application. See generally *Amgen Inc. v. Chugai Pharmaceutical Co.*, 927 F.2d 1200, 1212-14, 18 USPQ2d 1016, 1026-28 (Fed.Cir.) (generic DNA sequence claims held invalid under 35 U.S.C. § 112, first paragraph), *cert. denied*, 502 U.S. 856, 112 S.Ct. 169, 116 L.Ed.2d 132 (1991); *In re Fisher*, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970) (Section 112 "requires that the scope of the claims must bear a reasonable correlation to the scope of enablement provided by the specification to persons of ordinary skill in the art."). As this issue is not before us, however, we will not address whether claims 4 and 6 satisfy the enablement requirement of § 112, first paragraph, but will leave to the PTO the question whether any further rejection is appropriate.

We have considered the PTO's remaining arguments and find them not persuasive.

CONCLUSION

The Board's decision affirming the final rejection of claims 4-7 is reversed.

REVERSED



In re Miguel F. BRANA, Jose M.C. Berlanga, Marina M. Moset, Erich Schlick and Gerhard Keilhauer.

93-1393.

United States Court of Appeals,
Federal Circuit.

March 30, 1995.

Applicants appealed from decision of the United States Patent and Trademark Office (PTO) Board of Patent Appeals and Interferences, affirming patent examiner's rejections of claims for antitumor compound. The Court of Appeals, Plager, Circuit Judge, held that: (1) claimed specification for antitumor